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## STANDARD PATENT

Patrick Anselm Smith, Commissioner of Patents, grant a Standard Patent with the following particulars:

**Name and Address of Patentee:**

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**Names of Actual Inventors:** Jean Goux and Philippe Clement

**Title of Invention:** Free flowing particulate yeasts and use of these novel yeasts in frozen doughs

**Application Number:** 69781/87

**Term of Letters Patent:** Sixteen years commencing on 6 March 1987

**Priority Details:**

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FROZEN BAKERS YEAST

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(57) Claim

1. A frozen baker's yeast in the form of free flowing particles having a diameter of less than 3 mm and a dry matter content of from 70 to 85 percent by weight.

5. A process for the manufacture of frozen baker's yeast according to any one of the preceding claims, which comprises:

- a) dividing by extrusion fresh yeast into individual particles of less than 3 mm in diameter and bringing the particles by gentle drying to a dry matter content comprised between 70 and 85 percent by weight;
- b) cooling quickly and freezing the dried particles to a temperature of between -5°C and -30°C by fluidization in an air flow at a temperature between -10°C and -40°C; and
- c) recovering the frozen particles.

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10. In a process for manufacturing frozen doughs wherein yeast is added to dough and the resulting mixture is frozen to yield a frozen leavened dough, the improvement consisting of adding the baker's yeast of any one of claims 1 to 4 to the dough prior to the freezing of the dough.

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Application Number  
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Complete Specification

Priority :

Related

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COMPLETE SPECIFICATION  
(ORIGINAL)

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Application Number: 69781/87  
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Class

Int. Class

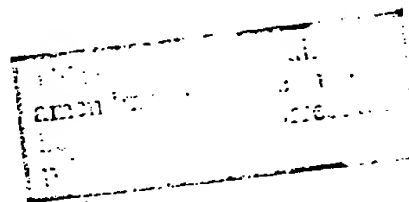
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Complete Specification for the invention entitled:

FREE FLOWING PARTICULATE YEASTS AND USE OF THESE NOVEL  
YEASTS IN FROZEN DOUGHS

The following statement is a full description of this invention, including the best method of performing it known to : US

FREE FLOWING FROZEN PARTICULATE YEASTS  
AND USE OF THESE NOVEL YEASTS IN FROZEN DOUGHS

5           The invention relates to a novel form of baker's  
yeasts, combining the advantages of fresh yeasts and dried  
yeasts. It relates to frozen yeast having a dry matter  
content ~~between 30 and 85%, preferably of at least 70% and~~  
10 ~~more preferably between 72 and 80%~~ <sup>content between 70 and 85%</sup> in the form of free-  
flowing particles incorporable directly in doughs. The  
invention also relates to the process for obtaining said  
novel yeasts and their use in the manufacture of frozen  
doughs.

15           Baker's yeasts are marketed essentially in two  
forms:

          . in the form of fresh yeast having a dry matter  
content between 27 and 35% occurring in blocks of 500 g or  
1 kg, or in divided form (bulk yeast or crumbled yeast) in  
bags of 11 to 25 kg. So that fresh yeast remains in divid-  
20 ed form and does not reagglomerate, it is often necessary  
to add to it a certain number of additives as indicated in  
British patents 1,530,866 and 1,560,478 or European patent  
application No. 0,153,117. This fresh yeast preserved at  
4°C must be used at the latest within one month and prefe-  
25 rably within a period of two weeks. In practice, the sto-  
rage conditions of fresh yeasts are rarely ideal and this  
reference temperature of 4°C is poorly respected. Besides  
fresh yeast which has to be preserved at +4°C, there  
exists marginally a commercialization of fresh yeast in  
30 blocks of 500 g or 1 kg in frozen form. The freezing obli-  
gatorily results in blocks of yeasts; the bulk form divid-  
ed yeast even with additives, agglomerates into blocks on  
freezing. This yeast must be thawed to be incorporated in  
doughs and used very rapidly after thawing. The freezing-  
35 thawing treatment is slightly penalizing for the yeast and  
the use of frozen yeasts in block form is inconvenient.

aker, 5 in dried yeast form with at least 92% of dry matter. Active dry yeasts have the drawback of having lost a part of their gassing power during the drying and the membranes of the yeast cells are more or less altered. They  
dried, 5 have the advantage of long preservation, the best performing instant dry yeasts packaged under vacuum or in neutral  
matter 5 gas have a loss of fermentative activity or gassing power of the order of 1% per month at 20°C. These dry yeasts  
and must always be rehydrated in a dough or in a liquid at at  
free- 10 least 16°C.

The 10 The prior art illustrated by U.S. patent 3,089,774 comprises an attempt to prepare a yeast having an intermediate moisture content, but this intermediate humidity yeast is not being produced, at least in Western countries  
lid 15 (Yeast Technology 1973, Reed and Peppler, page 94); its preservation properties are not sufficiently greater than those of fresh yeasts having about 30% of dry matter, preserved at +4°C. In addition these yeasts with intermediate humidity are very sensitive to temperature rise.

20 The invention consists in freezing by fluidization a divided baker's yeast, so as to bring down the yeast particles from a temperature equal to 0°C or positive to a temperature between -5°C and -30°C, preferably to -18°C or -20°C in a time comprised between 5 minutes and several  
25 hours, for example between 7 and 120 minutes or between 10 and 40 minutes.

30 The freezing by fluidization in a flow of air or of neutral gas between -10°C and -40°C, preferably between -20°C and -40°C and still more preferably between -18°C and -30°C, permits, on the one hand, rapid heat transfer between the gas and the solid (the yeast particles in a fluidized bed) without resorting to very low temperatures destructive of the yeast and, on the other hand, the individualization of the particles which do not become reagglomerated. It is this latter characteristic of the fluidization which is the most interesting, since the yeast  
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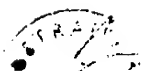
easily supports a slow drop in temperature and since it be  
preferable that freezing is not too rapid. fre

~~This process can, if need be, be applied to fresh~~ pr  
compressed baker's yeasts having a dry matter content tr  
5 between 30 and 40%, preferably of at least 35%, produce 5 i  
so as to be non-sticking and hence to be fluidizable  
without agglomerating. Great care must be taken in the  
design of the fluidized bed freeze apparatus and in the  
operations of fluidization of these fresh yeasts so as to  
10 obtain well individualized particles. The freezing must 10  
not be too rapid, the drop in temperature when the tempe-  
rature is lower than 0°C must not be more than 1°C per  
minute. The products obtained will still have a tendency  
to coalesce into clumps or lumps and even to agglomerate  
15 ~~completely, which is a considerable drawback.~~

This process applies preferentially to pre-dried  
yeasts which do not present any difficulty in fluidiza-  
tion. The pre-drying will also have the advantage of re-  
ducing the cost of storage and of transportation of these  
20 frozen yeasts due to the fact of their lower weights.  
Pre-drying to at least <sup>70%</sup> ~~72%~~ and preferably <sup>72% and still more preferal</sup> at least 74% of  
dry matter will guarantee against all risk of coalescing  
into clumps in packages and will make the yeast particles  
remain perfectly free-flowing.

25 This pre-drying can be conducted until the appear-  
ance of degradation of the cell membranes due to the fact  
of the elimination of internal water from the yeast cells.  
It must never exceed 85% of dry matter and preferably it  
will be continued up to about 77% of dry matter, that is  
30 to say in order to obtain between 74 and 80% of dry  
matter.

The pre-dried baker's yeast having a dry matter  
content comprised between 70 and 85% must be cooled as  
quickly as possible until a temperature comprised between  
35 -1°C and +4°C, as yeasts having these dry matter contents  
incline to become heated very quickly and they should not



ice it be left at temperatures higher than 15°C. Furthermore the freezing speed of the yeast is not a critical parameter provided it is not too rapid. In other words, as soon as the said speed is longer than about 5 to 10 minutes, there is no difference in the properties of the resulting yeast if the drop in temperature from 0°C to -20°C takes 10 minutes or 12 hours.

The freezing in a fluidized bed of yeast pre-dried to a dry matter content between 70 and 85%, preferably between 72 and 80%, hence of yeasts no longer containing external water or weakly bound water, considerably reduces the risk of crystallization which can affect the integrity of the cells.

The particulate frozen baker's yeasts in their preferred form having a dry matter content between 70 and 85%, preferably between 72 and 80% and still more preferably between 74 and 80%, have the advantages:

- . of being easy to handle and to incorporate or to disperse directly in the dough without prior thawing,

- . of preserving practically indefinitely the properties of the initial fresh yeasts, taken as they come out of production.

The particulate frozen yeasts, according to the invention, are particularly advantageous for the manufacture of frozen doughs intended to be preserved several months, then to be thawed, fermented and baked. Studies done in the Applicants' laboratories have shown that the manufacture of these frozen doughs requires, to obtain bread-products having uniformly and reproducibly the desired development, the use of yeasts rich in reserve substances, particularly in trehalose and having intact membranes. In practice, taking into account the distribution circuits, fresh yeasts can only be used several days after they leave the factory, and often they have not been fully maintained at 4°C, but rather at temperatures of the order of 10°C. Consequently, the results obtained



under No. 8,554, or as indicated in example 2 of U.S. patent 4,370,420 or in the examples of the U.S. patent 4,396,632, these patents being incorporated by reference.

A yeast having a dry matter content of 33% and containing 7.3% of nitrogen on dry matter is obtained. To this yeast is added a fine emulsion constituted by sorbitol esters or polyglycerol esters in a proportion of about 1.5% with respect to the dry matter of the yeast. It is extruded through a grid having perforations of width 0.5 to 3 mm, preferably 0.5 to 1 mm, and it is dried to about 75 to 78% of dry matter by a particularly gentle or mild drying that is to say a drying where the temperature of the yeast does not exceed 35°C and preferably 30°C.

The yeast vermicelli having about 75 to 78% of dry matter are transferred into a vibrated fluidizer supplied with air at -25°C by a refrigerator unit, the whole being carefully heat-insulated or placed in a thermostated enclosure.

In general, it is possible to employ a fluidizer of design identical with those used customarily for the drying of yeasts by fluidization, the essential difference being its supply with air at a negative temperature. The principle used is the same: through the solid product (the particulate yeast) is made to pass an ascending flow of a fluid (air at a negative temperature, for example -25°C) whose speed balances the weight of the solid product and will ensure expansion of the layer of individualized and mobile solid particles into a fluidized bed.

There is noted in the freezing in fluidized bed an increase of the dry matter content of the yeast particles comprised between 0 and 1%.

The yeast vermicelli are frozen between -18°C and -20°C in about 20 to 30 minutes and packaged on the one hand in air, on the other hand in a neutral gas after freezing.

These bags are kept at -20°C; the gassing power of

of U. the fresh yeast before drying and freezing and of the  
 pate particulate frozen yeast with about 77% dry matter as  
 rence obtained is measured after 1 month, 2 months and 3 months  
 13% at of preservation at  $-20^{\circ}\text{C}$ .

ed. 5 The fermentative activities or gassing powers ob-  
 tained, measured in the Burrows and Harrison fermentometer  
 according to the test A<sub>1</sub> disclosed in U.S. patents No.  
 4,370,420 or 4,396,632, incorporated by reference, remain  
 about 0.1 for the particulate frozen yeasts with about 77% dry  
 matter kept in preservation, within the range comprised  
 between 97% and 101% of the value obtained from the same  
 amount of dry matter of fresh yeast with 33% of dry matter  
 which has been used for obtaining the above-mentioned par-  
 ticulate frozen yeasts. No significant loss of fermenta-  
 tive activity is observed.

The frozen yeast having a dry matter content of  
 about 77% and occurring in the form of vermicelli remains  
 fluid, that is to say that the particles of short vermi-  
 celli are very easy to disaggregate and hence to handle  
 and to use. They have a good free flowability.

#### EXAMPLE 2

A frozen baker's yeast in short vermicelli of  
 diameter 0.5 to 1 mm, having a dry matter content of about  
 77% is prepared as in Example 1. The starting material is  
 a fresh yeast having a content of about 7% of nitrogen  
 with respect to dry matter and having a content of more  
 than 15% of trehalose with respect to the dry matter. The  
 frozen particulate yeast obtained is kept for 11 weeks at  
 $-20^{\circ}\text{C}$ .

During the preparation of the above particulate  
 frozen yeast, a sample is taken of the yeast having about  
 77% of dry matter before freezing and this sample is kept  
 for 11 weeks at  $+4^{\circ}\text{C}$ .

An American commercial fresh yeast, marketed in  
 the form of 1 pound blocks is sampled shortly after its  
 production and it is transported by air to the test site

at +4°C. This fresh yeast had at the time of the test of the manufacture of frozen doughs disclosed below, a dry matter content of 30% and a content of nitrogen with respect to dry matter of 9.1%.

5 A commercial instant dry yeast of good quality<sup>5</sup> with 95% of dry matter was also used.

These 4 yeasts are tested in a bread-making trial of type U.S. White Bread, scheme No-time dough from frozen doughs. The 4 yeasts are incorporated directly by blending  
 ...: 10 with the flour, which is very penalizing for instant dry  
 .. yeast which will find itself in contact with a flow of water at 3°C and a very cold dough. An instant dry yeast rehydrated under good conditions at at least 30°C and  
 15 give a performance at least equal to the control American fresh yeast. The particulate frozen yeast having about 77% of dry matter, kept 11 weeks at -20°C is incorporated directly without prior thawing.

The U.S. White Bread formula used has the  
 20 following composition:

	U.S. flour .....	100	parts by weight
	water .....	57	" "
	salt .....	2.25	" "
	yeast dry matter .....	1.6	" "
25	sugar .....	8	" "
	shortening .....	5	" "
	Panodan 90 (Diacetyl tartaric ester of monoglycerides manufactured by GRINDSTED) .....	0.3	" "
30	ascorbic acid .....	100 ppm	
	bromate 50/50 .....	20 ppm (pure bromate: 10 ppm)	

The temperature of the doughs at the end of kneading is 15°C and the doughs obtained are immediately placed  
 35 in a container at -40°C after moulding so as to freeze them to -20°C at the core. The duration between the end of

test the kneading and the end of the moulding and hence the  
 a d beginning of freezing is kept constant and equal to 25 mi-  
 n wi nutes. The frozen dough pieces obtained are kept at -20°C.  
 The dough pieces are thawed at the end of one, four,  
 alit 5 eight, twelve and sixteen weeks in a container at +26°C  
 where they are brought to 4°C at the core in 135 minutes.  
 ria Then, the proof time periods for a dough development at  
 izei constant volume, i.e. to a template, in an incubator at  
 ing 43°C and 94% relative humidity, are measured.

The following results are obtained:

	Proof-time expressed in minutes			
	Control fresh US yeast	Control dry yeast	Particulate yeast having 77% of dry matter kept 11 weeks at 4°C	Particulate yeast having 77% of dry matter, frozen, kept 11 weeks at -20°C
1 week	105	145	110	95
4 weeks	115	158	125	100
8 weeks	124	168	131	102
12 weeks	136	175	138	110
16 weeks	145	182	150	118

There is noted on the average over several tests an  
 increase in the proof time expressed in minutes per week  
 of preservation at -20°C of the frozen doughs:

control US fresh yeast ..... +2.6 minutes/week  
 control dry yeast ..... +2.4 minutes/week  
 frozen yeast, finely divided and  
 free-flowing having about 77% dry  
 dry matter, kept 11 weeks at -20°C +1.6 minute /week.

### EXAMPLE 3

A frozen baker's yeast in short vermicelli of  
 diameter 0.5 to 1 mm, having a dry matter content of about  
 77% is prepared as in Example 1. The strain used is NCYC  
 No. 995 disclosed in U.S. Patent No. 4,496,632.

The cultivation of this strain is conducted essen-  
 tially so as to obtain a fresh yeast with a relatively

high nitrogen content, equal or greater than 8%.

The emulsifier added to the fresh yeast is sorbitan monostearate in proportion of 0.3% with respect to the dry matter of the yeast.

5 The analysis of the free flowing particulate frozen yeast obtained is as follows (results of 8 tests):

		<u>Average</u>
Dry matter .....	74 to 80 %	77 %
Nitrogen on dry matter .....	7.9 to 8.6%	8.2%

10 Fermentative activity measured

in the Burrows and Harrison fermentometer according to the above-mentioned test A<sub>1</sub>, in 2 hours, notably disclosed in

15 the U.S. Patent 4,396,632 ... 159 to 170 ml 162 ml of CO<sub>2</sub>

The free flowing frozen particulate yeast obtained has a fermentative activity or gassing power of the same range as that of very active fresh compressed yeasts and a preservation at least equal to that of best dry yeasts, and an activity superior by the order of 25% to that of these dry yeasts.

#### EXAMPLE 4

A frozen baker's yeast in short vermicelli of diameter 0.5 to 1 mm, having a dry matter content of about 25 77% is prepared as in Example 1.

The strain used is an osmotolerant strain belonging to the group of strains NCYC R 30, NCYC 878, NCYC 996 or NCYC 890 disclosed in the U.S. Patents No. 4,328,250, 4,318,930 and 4,396,632.

30 These strains are multiplied as indicated in the aforesaid U.S. Patents. The emulsifier used is sorbitan monostearate in proportion of 0.3% with respect to the dry matter of the yeast.

35 The free flowing particulate yeast obtained having a dry matter content of about 77% has a fermentative activity or gassing power at least equal to 30 ml in test

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e dr  
A<sub>4</sub>, in one hour, and preferably at least equal to 40 ml of  
CO<sub>2</sub> in test A<sub>4</sub>, in one hour, described in the aforesaid  
U.S. Patents.

oze, 5 This free flowing particulate yeast is used for  
making Danish Pastry according to a formula of the type:

	Flour .....	100	parts by weight
	Sugar .....	15	" "
	Shortening .....	15	" "
	US fresh yeast		
10	+ salts, oxidants and emulsifiers	15	" "
	Water .....	50	" "

15 The kneading is performed in three steps in a  
double-casing horizontal mixer containing ice water at  
-18°C. The starting dough temperature is of 0°C and the  
final dough temperature is maximum 10°C.

In such a process, it is very difficult to use dry  
yeasts unless this yeast is rehydrated at at least 20°C  
and after 1 hour, the yeast cream obtained is cooled down.

20 3 to 5 parts by weight of the free flowing parti-  
culate yeast is incorporated directly into the dough in  
place of the 15 parts by weight of fresh compressed yeast  
to obtain at least the same dough development.

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30

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A frozen baker's yeast in the form of free flowing particles having a diameter of less than 3 mm and a dry matter content of from 70 to 85 percent by weight.
2. A frozen baker's yeast according to claim 1, having a dry matter content comprised between 72 to 80 percent by weight.
3. A frozen baker's yeast according to one of claims 1 and 2, having a dry matter content comprised between 74 to 80 percent by weight.
4. A frozen baker's yeast according to any one of claims 1 to 3, wherein the free flowing particles have a diameter of less than 1 mm.
5. A process for the manufacture of frozen baker's yeast according to any one of the preceding claims, which comprises:
  - a) dividing by extrusion fresh yeast into individual particles of less than 3 mm in diameter and bringing the particles by gentle drying to a dry matter content comprised between 70 and 85 percent by weight;
  - b) cooling quickly and freezing the dried particles to a temperature of between  $-5^{\circ}\text{C}$  and  $-30^{\circ}\text{C}$  by fluidization in an air flow at a temperature between  $-10^{\circ}\text{C}$  and  $-40^{\circ}\text{C}$ ; and
  - c) recovering the frozen particles.
6. A process according to claim 5, wherein the air flow is at a temperature comprised between  $-18^{\circ}\text{C}$  and  $-40^{\circ}\text{C}$ .



ing 7. A process according to any one of claims 5 and 6,  
wherein the fresh yeast is divided by extrusion to a  
diameter of less than 1 mm.

ing 8. A process according to any one of claims 5 to 7,  
y wherein the fresh yeast is dried to a dry matter content  
comprised between 72 and 80 percent by weight.

1 9. A process according to any one of claims 5 to 8,  
wherein a protective additive is added to the yeast before  
extrusion.

10. In a process for manufacturing frozen doughs  
wherein yeast is added to dough and the resulting mixture is  
frozen to yield a frozen leavened dough, the improvement  
consisting of adding the baker's yeast of any one of claims  
1 to 4 to the dough prior to the freezing of the dough.

11. Frozen baker's yeast obtained by the process  
according to any one of the claims 5 to 9.

DATED this 21st day of January, 1991.

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